



## RESEARCH ARTICLE

### DIVERSITY OF TREE SPECIES IN SHARAVATHI WILDLIFE SANCTUARY, SHIVAMOGGA

\*<sup>1</sup>Adithya Rao, G. S., <sup>2</sup>Padmalatha, H. V. and <sup>2</sup>Kumaraswamy Udupa, E. S.

<sup>1</sup>Department of PG Studies and Research in Botany, Kuvempu University, Shankaraghatta, Shivamogga, Karnataka

<sup>2</sup>Department of Botany, Sri. J.C.B.M. College, Sringeri, Chikkamagaluru, Karnataka

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#### ABSTRACT

Sharavathi Wildlife Sanctuary (SWLS) of Karnataka harboring rich floristic diversity and different types of forest. The diversity of tree species of buffer zone of SWLS studied by using six transects of 1.5km distance. A total of 100 species belonging to 75 genera and 40 families were documented in 30 quadrates during the survey. *Olea dioica* emerged as most important tree species in SWLS. Oleaceae emerged as most important family exhibits highest Family Importance Value. Among the 100 trees species, 16 species yield Non Timber Forest Products (NTFP) and 26 species are medicinally important plants. The presence of *Myristica dactyloides*, *Dipterocarpus indicus*, *Dysoxylum malabaricum*, *Diospyros paniculata*, *Elaeocarpus tuberculatus*, *Eugenia macrosepala*, *Litsea floribunda*, *Mastixia arborea*, *Polyalthia fragranse*, indicates the evergreen nature of the forest whereas the presence of *Terminalia paniculata*, *Randia dumetorum*, *Flacourtia montana*, *Grewia tiliifolia*, *Careya arborea*, *Cedrela toona*. represented the moist deciduous nature of the forest.

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## INTRODUCTION

India is considered to be one of the mega-diversity centers of the world containing diverse ecosystem with thick evergreen and many other forest types. Western Ghats of India is considered as one of the 34 biodiversity hotspots in the world (Myers et al., 2000). The Western Ghats harbors more than 5000 species of flowering plants (Nair and Daniels, 1986) out of which 1600 are endemic to the region (Mackinnan and Mackinnan, 1986). The tropical wet evergreen forest that occur in the Western Ghats region of Karnataka represent the most luxuriant type of vegetation seen on the earth. Tropical forests have received much attention in recent years because of their species richness, high standing biomass and greater productivity (Denslow, 1987). Thus only a small portion can be preserved in National Parks, Wildlife Sanctuaries and Biosphere Reserves. These protected areas are critically important for species preservation. Among 500+ Wildlife sanctuaries in India, Sharavathi Wildlife Sanctuary (SWLS) in Western Ghats is well known for its falls (upper catchment) is one of the mega centers of endemism harboring divers kinds of flora and fauna, which are adapted to various kinds of micro

and macro habitats. Among them, macro habitats have higher richness and endemism and micro habitats such as wet tree trunks, wet rocks etc., have distinctive species. All the habitats in Karnataka harbor economically useful species including medicinal plants vital for human survival (Ganeshaiah et al., 2002). Out of nearly 17,500 flowering plant species found in India, over 1600 are used in traditional medicinal system of Ayurveda (Kumar et al., 2012). Sharavathi river basin is rich in medicinal plants used in ethnobotanical system. Hence, it is a vital necessity to save these habitats for the survival of life saving plants.

## MATERIALS AND METHODS

### Study Area

SWLS declared from government order No. AFD70/FWL71/ Dated 20.04.1972 with a geographical area 431.23km<sup>2</sup> located in Shivamogga, Karnataka. One third portion of the sanctuary is occupied by Linganamakki reservoir and rest of the area had divided into core (74.33 km<sup>2</sup>), buffer (170.67 km<sup>2</sup>) and tourism zones (57.53km<sup>2</sup>). Area lies between 13°55' to 14°12' lat., 74°38' to 75°00' long. and altitude varies from 94-1102m (Anon, 2006). The sanctuary has evergreen, semi-evergreen and moist deciduous forest types with a spectacular Jog falls in it.

\*Corresponding author: Adithya Rao, G. S.

Department of PG Studies and Research in Botany, Kuvempu University, Shankaraghatta, Shivamogga, Karnataka

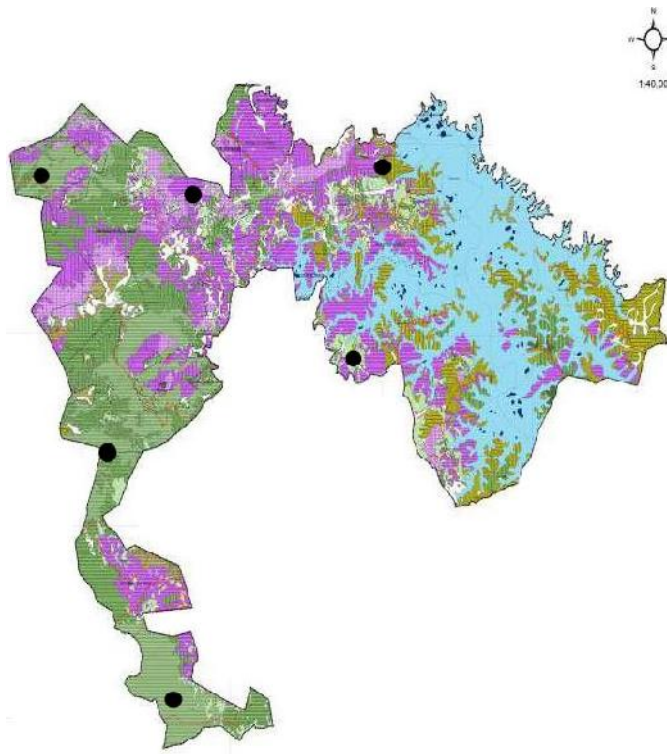


Fig.1. Map showing the study sites of SWLS

**MATERIALS AND METHODS**

In the present study, transect method is used for vegetation survey. It is carried out by laying six transects of length 1.5 km at random in the buffer zone of the forest during the year of January 2013 to March 2014. This line transect is divided into five quadrates of size 20m × 20m alternatively on both side by leaving 350m gap (Fig.1). The tree species ( 10cm GBH) found in the quadrates were recorded and identified by using available manuals and flora (Saldanha and Nicolson, 1976; Yoganarasimhan and Razi, 1981; Gamble, 1998; Ramaswamy et al. 2001; Bhat, 2003; Gowda, 2004) and photographed.

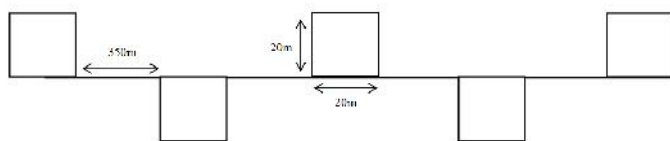


Fig.2. Graphical representation of the transect plotted in the study area

Species composition and diversity indices such as Shannon’s (H) and Simpson’s (D) values are calculated (Shannon et al. 1949, Simpson 1949, Magurran 1988).

<b>Frequency</b>	:	$\frac{\text{Number of quadrate in which species occur}}{\text{Total number of quadrates studied}}$
<b>Density</b>	:	$\frac{\text{Total number of individuals of a species}}{\text{Total number of quadrates studied}}$
<b>Abundance</b>	:	$\frac{\text{Total number of individuals of a species in all the quadrates}}{\text{Total number of quadrates in which the species as occurred}}$

**Basal area** :  $(GBH)^2/4\pi$

**Relative dominance** :  $\frac{\text{Basal area of a species}}{\text{Total basal area of all the species}} \times 100$

SIV/FIV– Relative frequency + Relative density + Relative dominance

**Shannon’s diversity Index: H** = - pi ln pi

Where, pi = (ni/N)

**Simpson’s value, D** = ni(ni-1)/N(N-1)

**RESULTS**

A total of 100 species belonging to 75 genera and 40 families were documented in 30 quadrants during the survey which includes two monocotyledons i.e., *Caryota urens* and *Bambusa bambos*. The study reveals that *Olea dioica* is more frequently distributed and having highest density (0.77 & 2.87 respectively) and is followed by frequency *Ixora brachiata* (0.63) and density *Terminalia paniculata* (2.67). The most abundant species of trees is *Myristica dactyloides* (7.4) and is followed by *T. paniculata* (6.67) (Table 1). *Olea dioica* exhibit highest basal area (23682.45 m<sup>2</sup>) followed by *Terminalia paniculata* (14163.61 m<sup>2</sup>) whereas *O. dioica* emerged as most important tree species in SWLS having SIV of 30.85 which is followed by *T. paniculata* (20.16) The documented tree species showed Shannon’s diversity value of 3.95 and Simpson’s species richness value 0.03. Among the 100 trees species, 16 species yield Non Timber Forest Products (NTFP) and 26 species are medicinally important plants (Table 1).

**Table 1. Diversity of trees of Sharavathi Wildlife Sanctuary**

S.No.	Name of Species	F	D	A	SIV
1	<i>Acacia auriculiformis</i>	0.10	0.37	3.67	1.79
2	<i>Acrorychia pedunculata</i>	0.10	0.17	1.67	1.01
3	<i>Actinodaphne hookeri</i>	0.30	0.70	2.33	4.42
4	<i>Aegle marmelos</i> *#	0.03	0.03	1.00	0.28
5	<i>Aglaia roxburghiana</i>	0.27	0.83	3.13	6.10
6	<i>Albizia odoratissima</i>	0.03	0.07	2.00	0.35
7	<i>Aporosa lindleyana</i>	0.53	2.10	3.94	11.34
8	<i>Archidendron monodelphum</i>	0.03	0.03	1.00	0.29
9	<i>Artocarpus hirsutus</i>	0.10	0.17	1.67	1.04
10	<i>Artocarpus lacucha</i> *#	0.03	0.03	1.00	0.28
11	<i>Atalantia wightii</i>	0.17	0.93	5.60	3.63
12	<i>Bambusa bambos</i> *	0.03	0.10	3.00	0.42
13	<i>Bauhinia malabarica</i>	0.03	0.03	1.00	0.28
14	<i>Buchanania lanzan</i>	0.10	0.33	3.33	1.42
15	<i>Canarium strictum</i> *#	0.03	0.07	2.00	0.43
16	<i>Canthium dicoccum</i>	0.30	0.60	2.00	3.44
17	<i>Careya arborea</i>	0.37	0.97	2.64	5.34
18	<i>Caryota urens</i> *	0.03	0.03	1.00	0.28
19	<i>Casuarina equisetifolia</i>	0.07	0.20	3.00	0.90
20	<i>Cedrela toona</i>	0.03	0.07	2.00	0.35
21	<i>Chukrasia tabularis</i>	0.03	0.03	1.00	0.27
22	<i>Cinnamomum malabattrum</i> *#	0.27	0.53	2.00	3.39
23	<i>Dalbergia latifolia</i>	0.07	0.07	1.00	0.56
24	<i>Dillenia pentagyna</i>	0.13	0.20	1.50	1.39
25	<i>Dimocarpus longan</i>	0.47	2.47	5.29	19.34
26	<i>Diospyros buxifolia</i>	0.10	0.13	1.33	0.99
27	<i>Diospyros candolleana</i>	0.27	0.57	2.13	3.07
28	<i>Diospyros montana</i>	0.13	0.40	3.00	1.77

29	<i>Diospyros ovalifolia</i>	0.10	0.27	2.67	1.51
30	<i>Diospyros paniculata</i>	0.10	0.13	1.33	0.90
31	<i>Diospyros pruriens</i>	0.10	0.13	1.33	0.93
32	<i>Dipterocarpus indicus</i> *	0.03	0.03	1.00	0.32
33	<i>Dysoxylum malabaricum</i>	0.13	0.57	4.25	3.05
34	<i>Elaeocarpus serratus</i>	0.30	0.57	1.89	3.51
35	<i>Elaeocarpus tuberculatus</i> #	0.03	0.03	1.00	0.30
36	<i>Eucalyptus</i> sp. *#	0.07	0.43	6.50	1.42
37	<i>Eugenia hemispherica</i>	0.07	0.07	1.00	0.56
38	<i>Eugenia macrosepala</i>	0.13	0.20	1.50	1.26
39	<i>Euonymus</i> sp.	0.13	0.40	3.00	1.88
40	<i>Ficus amplissima</i>	0.03	0.03	1.00	0.45
41	<i>Ficus</i> sp.	0.07	0.07	1.00	0.59
42	<i>Ficus tsiela</i>	0.07	0.07	1.00	0.60
43	<i>Flacourtia indica</i>	0.03	0.03	1.00	0.28
44	<i>Flacourtia montana</i> #	0.10	0.10	1.00	0.83
45	<i>Garcinia gummi-gutta</i> *#	0.20	0.33	1.67	2.18
46	<i>Garcinia indica</i> *#	0.03	0.03	1.00	0.28
47	<i>Garcinia morella</i>	0.43	1.70	3.92	9.16
48	<i>Glochidion zeylanicum</i>	0.33	0.60	1.80	3.67
49	<i>Grewia tiliaefolia</i> #	0.17	0.23	1.40	1.62
50	<i>Holigarna arnotiana</i>	0.13	0.37	2.75	2.04
51	<i>Holigarna beddomei</i>	0.07	0.07	1.00	0.56
52	<i>Holigarna grahamii</i>	0.23	0.47	2.00	4.10
53	<i>Hopea ponga</i>	0.37	1.70	4.64	11.80
54	<i>Ixora brachiata</i>	0.63	1.67	2.63	9.10
55	<i>Ixora nigricans</i>	0.03	0.03	1.00	0.28
56	<i>Knema attenuata</i>	0.43	2.23	5.15	14.80
57	<i>Lagerstroemia lanceolata</i>	0.23	0.27	1.14	2.30
58	<i>Lansea coromandelica</i>	0.07	0.07	1.00	0.62
59	<i>Leea indica</i>	0.03	0.03	1.00	0.27
60	<i>Ligustrum gamblei</i>	0.03	0.13	4.00	0.49
61	<i>Linociera malabarica</i>	0.07	0.07	1.00	0.55
62	<i>Litsea coreacea</i>	0.17	0.17	1.00	1.39
63	<i>Litsea floribunda</i>	0.17	0.27	1.60	1.64
64	<i>Lophopetalum wightianum</i>	0.10	0.13	1.33	1.50
65	<i>Macaranga peltata</i>	0.10	0.17	1.67	0.98
66	<i>Mallotus philippinensis</i>	0.03	0.07	2.00	0.35
67	<i>Mallotus tetracoccus</i>	0.03	0.03	1.00	0.27
68	<i>Mangifera indica</i> #	0.43	0.60	1.38	5.00
69	<i>Mappia foetida</i> #	0.07	0.07	1.00	0.55
70	<i>Mastrixia arborea</i>	0.03	0.03	1.00	0.27
71	<i>Memecylon talbotianum</i> #	0.37	1.90	5.18	7.17
72	<i>Memecylon umbellatum</i> #	0.33	0.87	2.60	4.33
73	<i>Mimusops elengi</i> #	0.27	0.87	3.25	4.26
74	<i>Myristica dactyloides</i> *#	0.17	1.23	7.40	5.79
75	<i>Myristica malabarica</i> *#	0.07	0.07	1.00	0.56
76	<i>Noelitsea scrobiculata</i>	0.03	0.07	2.00	0.35
77	<i>Nothopegia beddomei</i>	0.10	0.13	1.33	0.90
78	<i>Nothopegia racemosa</i>	0.33	0.73	2.20	3.80
79	<i>Olea dioica</i>	0.77	2.87	3.74	30.85
80	<i>Persea macrantha</i> #	0.23	0.47	2.00	4.19
81	<i>Phaganelia longifolia</i> #	0.03	0.03	1.00	0.29
82	<i>Phyllanthus emblica</i> *#	0.10	0.10	1.00	0.83
83	<i>Polyalthia fragrans</i>	0.07	0.30	4.50	1.50
84	<i>Pterospermum diversifolium</i>	0.23	0.43	1.86	2.86
85	<i>Randia dumatorum</i> #	0.37	1.40	3.82	6.18
86	<i>Sapium insigne</i>	0.07	0.07	1.00	0.75
87	<i>Schleichera oleosa</i>	0.03	0.20	6.00	0.71
88	<i>Semicarpus anacardium</i> *	0.03	0.03	1.00	0.28
89	<i>Spondias mangifera</i> *#	0.03	0.10	3.00	0.43
90	<i>Sterculia guttata</i>	0.07	0.07	1.00	0.55
91	<i>Symplocos cochinchinensis</i>	0.20	0.47	2.33	2.52
92	<i>Symplocos racemosa</i>	0.33	0.87	2.60	4.68
93	<i>Syzygium caryophyllatum</i> #	0.20	0.23	1.17	1.76
94	<i>Syzygium cumini</i> *#	0.50	1.17	2.33	8.98
95	<i>Syzygium leatum</i>	0.03	0.10	3.00	0.43
96	<i>Tabernaemontana heyneana</i> #	0.10	0.13	1.33	0.90
97	<i>Terminalia paniculata</i>	0.40	2.67	6.67	20.16
98	<i>Terminalia tomentosa</i>	0.13	0.57	4.25	3.23
99	<i>Vitex altissima</i>	0.27	0.60	2.25	9.38
100	<i>Zanthoxylum rhetsa</i> #	0.03	0.03	1.00	0.27

F: Frequency D: Density A: Abundance SIV: Species Importance Value\* Non-Timber Forest Products (NTFP) # Medicinal Tree Species

In the present study, 40 families were documented in 30 quadrates. Among these, Rubiaceae is most frequently distributed family (0.87) and followed by Oleaceae (0.80). The family Rubiaceae shows highest density followed by Myristicaceae (3.70 & 3.53 respectively) and Combretaceae emerged as most abundant family (8.08) followed by Myristicaceae (7.57) (Table 2). Oleaceae contributes highest basal area (24827.65 m<sup>2</sup>) followed by Combretaceae (24367.57m<sup>2</sup>). Oleaceae emerged as most important family exhibits highest FIV (25.53) and is followed by Anacardiaceae (23.15) (Table 2). The documented families showed Shannon's diversity value 3.18 and Simpson's richness value 0.05.

Table 2. Diversity of Families in the study area

S.No.	Family	F	D	A	FIV
1	Anacardiaceae	0.77	2.90	3.78	23.15
2	Annonaceae	0.07	0.33	5.00	1.63
3	Apiaceae	0.03	0.03	1.00	0.34
4	Apocyanaceae	0.10	0.13	1.33	1.09
5	Arecaceae	0.03	0.03	1.00	0.34
6	Burseraceae	0.03	0.07	2.00	0.46
7	Caesalpiniaceae	0.03	0.03	1.00	0.34
8	Casuarinaceae	0.07	0.20	3.00	1.01
9	Celastraceae	0.23	0.53	2.29	3.92
10	Clusiaceae	0.47	2.07	4.43	11.15
11	Combrataceae	0.40	3.23	8.08	22.47
12	Dilleniaceae	0.13	0.20	1.50	1.59
13	Dipterocarpaceae	0.37	1.73	4.73	10.82
14	Ebenaceae	0.57	1.63	2.88	10.32
15	Elaeocarpaceae	0.33	0.60	1.80	4.41
16	Euphorbiaceae	0.60	2.53	4.22	14.16
17	Flacourtiaceae	0.13	0.13	1.00	1.36
18	Icacinaceae	0.07	0.07	1.00	0.68
19	Lauraceae	0.67	2.20	3.30	17.58
20	Lecythidaceae	0.37	0.97	2.64	5.64
21	Lythraceae	0.23	0.27	1.14	2.63
22	Malvaceae	0.17	0.23	1.40	1.90
23	Melastomataceae	0.50	2.77	5.53	11.48
24	Meliaceae	0.40	1.50	3.75	10.87
25	Mimosaceae	0.17	0.47	2.80	2.75
26	Moraceae	0.27	0.37	1.38	3.81
27	Myristicaceae	0.47	3.53	7.57	22.17
28	Myrtaceae	0.70	2.20	3.14	14.74
29	Oleaceae	0.80	3.07	3.83	25.53
30	Papilionaceae	0.07	0.07	1.00	0.68
31	Phyllanthaceae	0.33	0.60	1.80	4.18
32	Poaceae	0.03	0.10	3.00	0.48
33	Rubiaceae	0.87	3.70	4.27	19.84
34	Rutaceae	0.30	1.17	3.89	5.56
35	Sapindaceae	0.50	2.67	5.33	17.50
36	Sapotaceae	0.27	0.93	3.50	4.67
37	Sterculiaceae	0.27	0.50	1.88	3.58
38	Symplocaceae	0.43	1.33	3.08	7.58
39	Verbanaceae	0.27	0.60	2.25	7.26
40	Vitaceae	0.03	0.03	1.00	0.34

F: Frequency, D: Density, A: Abundance, BA: Basal area, FIV: Family Importance Value

## Conclusion

SWLS shows very rich diversity of trees. The presence of 100 species of trees belonging to 40 families within 30 quadrates (1.2 hectares) indicates their species richness. *Olea dioica* is the most frequently distributed and species with density, basal area and is emerged as most important tree species in the SWLS. It is found in evergreen, semi-evergreen and moist deciduous forest of the area. Hence the family Oleaceae contributes highest FIV. The most abundant species is

contributed by *Myristica dactyloides* which is one of the RET species with NTFP value. The Shannon's diversity value of 3.95 and Simpson's species richness of 0.03, revealed very good tree diversity in the sanctuary. Among the documented tree species 16 species have NTFP values and 26 species are medicinally important. Some of medicinally important tree are *Phaganelia longifolia*, *Mappia foetida*, *Myristica dactyloides*, *Phyllanthus emblica*. Species for which seeds, bark, leaf or fruits are extracted as NTFPs like *Myristica malabarica*, *M. dactyloides*, *Garcinia gummi-gutta*, *Cinnamomum malabatum*. The presence of *Myristica dactyloides*, *Dipterocarpus indicus*, *Dysoxylum malabaricum*, *Diospyros paniculata*, *Elaeocarpus tuberculatus*, *Eugenia macrosepala*, *Litsea floribunda*, *Mastixia arborea*, *Polyalthia fragrance*, *Pterospermum diversifolium*. indicates the evergreen nature of the forest whereas the presence of *Terminalia paniculata*, *Randia dumetorum*, *Flacourtia montana*, *Grewia tiliaefolia*, *Careya arborea*, *Cedrela toona*. represented the moist deciduous nature of the forest.

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